Halpha emission in the Fornax cluster

Amanda Lopes[(1)], Paola Dimauro[(1)], Arianna Cortesi[(2,3)], Analía Smith Castelli[(4,5)]

(1) Observatório Nacional, ON/MCTI - (2) CBPF - (3) Observatório do Valongo, OV - (4) Instituto de Astrofísica de La Plata, CONICET - UNLP - (5) Facultad de Ciencias Astronómicas y Geofísicas, UNLP

Contact: amandalopes@on.br

Introduction

The detection of emission in galaxies is a valuable information because they can be related to physical processes that happened in the galaxy. Emission lines such Hα and [OII], for example, can be used as probes of star formation activity. The connection between emitters from different morphological classes associated to a cluster environment provides not only essential clues to understand the evolutionary stage of the cluster itself, but also how a denser environment affects the properties of the galaxies.

The Southern Photometric Local Universe Survey (S-PLUS) is a great tool to develop this analysis, as it mapps the southern sky in 5 broad-bands of the Sloan Digital Sky Survey (SDSS) and 7 narrow-bands tracing specific spectral features such as [OII], Hδ and Hα among others. This filter configuration is ideal to infer emission by the combination of narrow and broad bands.

In this context, the Fornax galaxy cluster have Hα and [OII] lines falling in the S-PLUS narrow filters, J0660 and J0378, respectively. Fornax is the second nearby rich cluster after Virgo and it is observable from the southern sky.

In this poster we focus in the preliminary results about the Hα emitters belonging to the Fornax cluster, and its relation to the different morphological types.

How to detect Hα emission?

The standard approach to detect emission is using a color-magnitude diagram. In our case here, an excess in the color (*r -J0660)* indicates the presence of Hα emission. Such technique works well for late type galaxies, however early type galaxies have a very high continuum that complicates the analysis.

In order to improve the selection of Hα emitters among lenticular and elliptical galaxies, we investigate the different definitions of magnitude. The tests were apply to a catalogue based on a crossmatch between 23 fields in S-PLUS and a list of known Fornax members from literature compilation.

The AUTO type is proved not ideal for these objects, mostly underestimating the emission influence. The analysis using (*r -J0660)* in a given aperture is an interesting alternative, however due to the proximity of Fornax, the galaxy members have varying sizes, and choosing only one aperture to analyze the whole cluster is not a valid option. So, which magnitude aperture should we use?

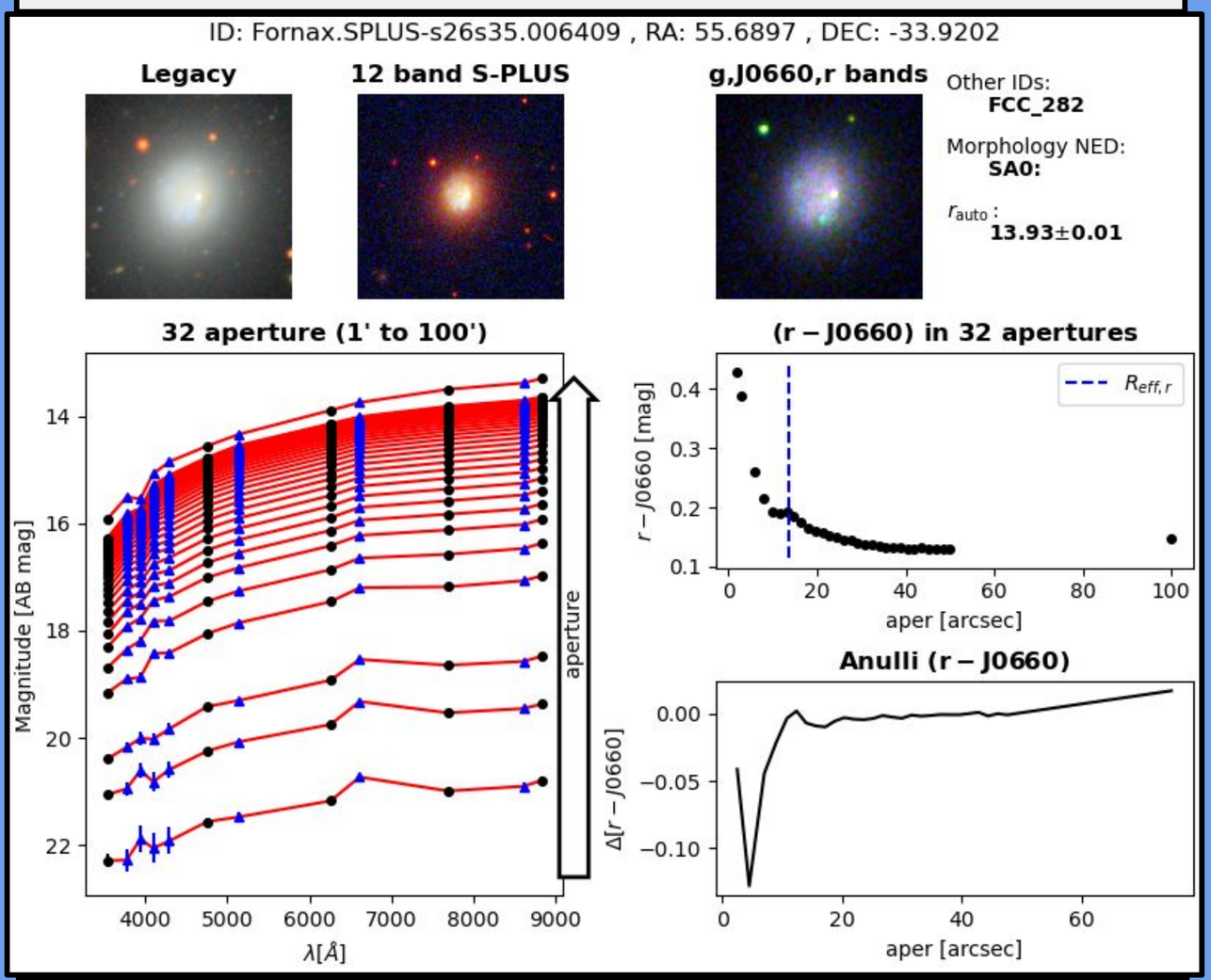

Figure 1: Example of a combine analysis of emission, including Legacy and S-PLUS images, basic information, photo-spectrum and color vs. aperture. In the right image, it is clear that the source has emission and from the plots below the signal of emission varies with the aperture.

Preliminary results

A first proposition is to use the aperture closest to the effective radius (R_{eff}) of the source. We apply the R_{eff} obtained by Sextractor in the 227 galaxies members of Fornax observed in S-PLUS.

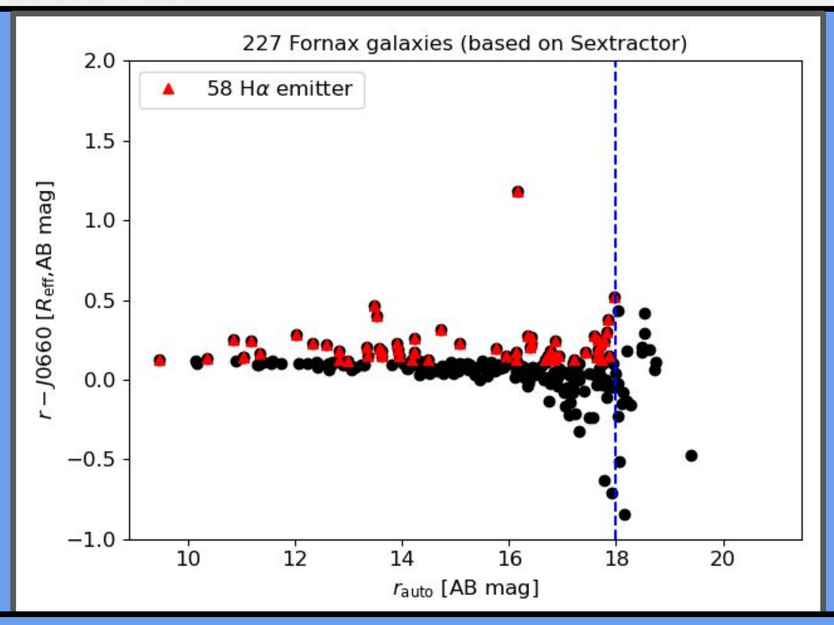

Figure 2: Color-magnitude diagram to identify emission in Fornax galaxies. The color is based on the magnitudes corresponding to the apertures closest to the effective radius of the source. After excluding duplicates and r_{auto}<18,, we select 58 objects as Hα emitters, i.e. (*r-J0660*)>0.12.

Considering the morphological classification from NASA/IPAC Extragalactic Database (NED), from the 58 Hα emitters: 36 are early type, 19 are late type, 1 dwarf, 2 without morphology.

This methodology fails to identify a few large late-type galaxies as emitters, which have asymmetric emission distribution.

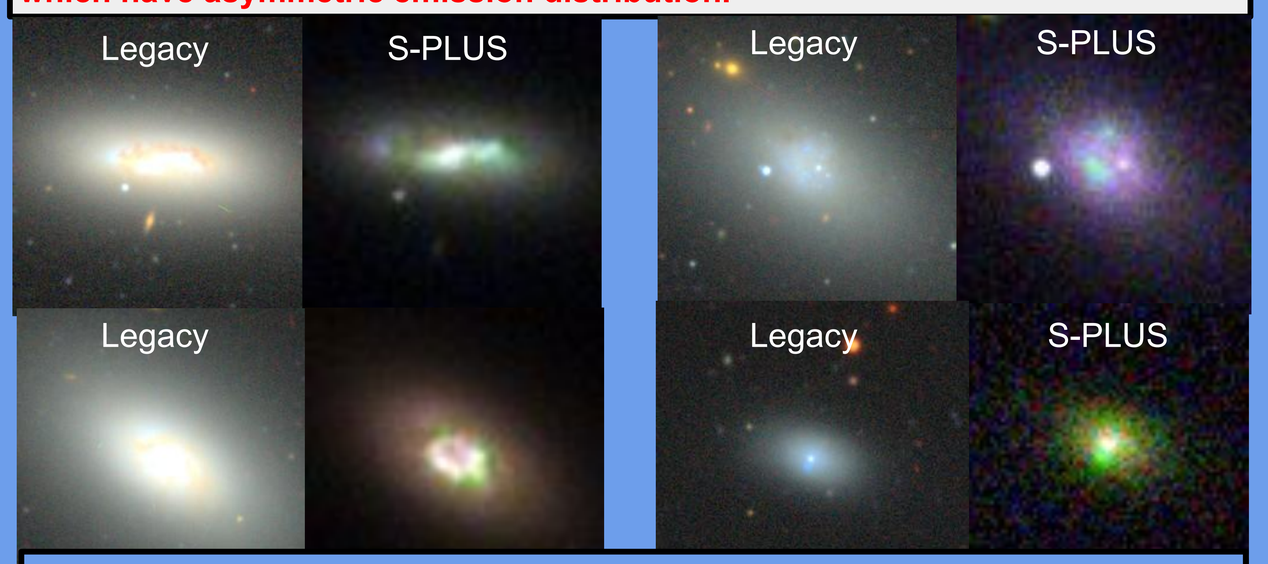

Figure 3: Examples of early-type galaxies in Fornax with Hα emission.

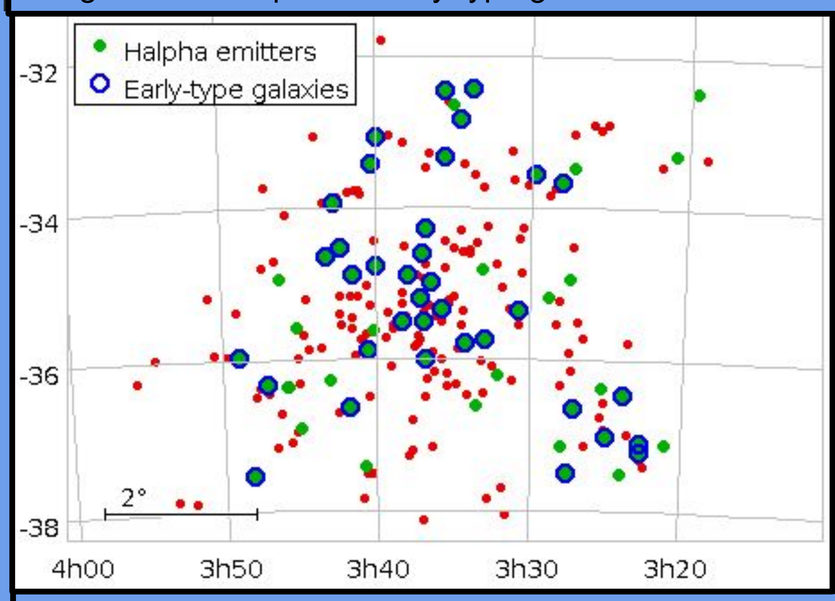

Figure 4: Spatial distribution of Hα emitters in Fornax.

Ongoing work

- Compare the Hα emitters presented here with the selection using the effective radius derived from GALFIT.
- Compare the properties of the emitters with the non-emitters for each morphological type.